AMENDMENT TO THE CLAIMS

- **Format of Claim Amendments**

Applicants have amended the claims as indicated below. Pursuant to the revised format to 37 C.F.R. 1.121 which is planned to be officially adopted by the USPTO in July of 2003, and which in now permitted by the office pursuant to the USPTO's release of January 31, 2003, Applicants herein submit only one version of the claims with markings to show changes. A detailed listing of all claims that are, or were in the application, are presented.

- **Statement with Respect to Scope of Amended and Non-Amended Claims**

Amendments to, cancellation of, and additions to, the claims are made in order to streamline prosecution of the case to embodiments that are presently anticipated to be of commercial significance, and are not made for a purpose of patentability. Any amendment, cancellation or addition made herein should not be construed in any manner as indicating Applicants' surrender of any subject matter of the application, or surrender of any equivalent to any element asserted in one or more claims. Applicants do not concede that the scope of the claims set forth below fail to extend as far as the original claims. Furthermore, any narrowing which may be evinced with respect to subject matter covered by the claims as a whole, or by one or more claims of the appended claims, when compared to claims previously in the application, should not be interpreted as indicating that the Applicants have generally disclaimed the territory between the original claimed subject matter and the amended claimed subject matter. Applicants intend each term of the claims set forth below to be read with respect to the full-breadth of the language of the claims and not to be confined to a strict literal read of amended terms. Amended claims elements are to be construed to include substantial equivalents known to those of ordinary skill in the art. Applicants assert that the amendments are made without prejudice and reserve all rights to prosecute any canceled claims, and claims preceding any amendment, and other disclosed (but not presently claimed) embodiments in the application, in future continuation applications, divisional applications, continuation-in-part applications, continuing prosecution applications, requests for continuing examination, re-examination applications and any other application claiming priority from or through the present application.

COMPLETE LIST OF CLAIMS THAT ARE OR HAVE BEEN BEFORE THE OFFICE AFTER ENTRANCE OF THE AMENDMENTS MADE HEREIN

Claim 1 (CANCELED).

2. (PREVIOUSLY PRESENTED) The method of compressing data as recited in Claim 1 4, wherein transforming the first and second data sets is performed utilizing a tensor product wavelet transform.

3. (ORIGINAL) The method of compressing data as recited in Claim 2, wherein remainders from one subband are transmitted to another subband.

4. (PREVIOUSLY PRESENTED) A method of compressing data including first and second data sets comprising:

transforming the first and second data sets into corresponding first and second transform coefficient sets;

generating data representing differences between the first and second transform coefficient sets; and

encoding the generated data for transmission,

wherein said generating includes the steps of:

estimating the differences between the first and second transform coefficient sets to provide motion vectors;

applying the motion vectors to the first transform coefficient set to produce a prediction of the second transform coefficient set; and

subtracting the prediction from the second transform coefficient set resulting in a set of prediction errors.

5. (Original) The method of compressing data as recited in Claim 4, wherein the first and second transform coefficient sets are error corrected.

6. (Original) The method of compressing data as recited in Claim 4, wherein applying the motion vectors to the first transform coefficient set further includes applying a mask about each effected transform coefficient to obtain a weighted average of neighboring transform coefficients.

7. (Original) The method of compressing data as recited in Claim 4, wherein estimating differences between the first and second transform coefficient sets includes:

generating a search region about a subset of transform coefficients from one of the first and the second transform coefficient sets;

applying a related subset of transform coefficients from the other of the first and the second transform coefficient sets to the search region; and

traversing incrementally the related subset of transform coefficients within the search region to a position representing a best incremental match.

8. (Original) The method of compressing data as recited in Claim 7, further including traversing fractionally the related subset of transform coefficients within the search region to a position representing a best fractional match.

9. (PREVIOUSLY PRESENTED) The method of compressing data as recited in Claim 4, wherein transforming of the first and second date sets produces the first transform coefficient set as a first collection of subbands and the second transform coefficient set as a second collection of subbands.

10. (PREVIOUSLY PRESENTED) The method of compressing data as recited in Claim 4, wherein transforming of the first and second date sets produces the first transform coefficient set as a first collection of subbands and the second transform coefficient set as a second collection of subbands, and further including macro-block packing the second collection of subbands to form a subband macro-block grouping.

11. (Original) The method of compressing data as recited in Claim 10, further including applying weighting to subband macro-blocks within the subband macro-block grouping.

12. (Original) The method of compressing data as recited in Claim 10, further including detecting changes between the subband macro-block grouping and a reference.

13. (Original) The method of compressing data as recited in Claim 12, wherein detecting changes between the subband macro-block grouping and the reference is based on a distortion evaluation according to a general equation of the form:

$$e_c = \sum_i W_i \|G - R\|_x^{Px} .$$

14. (Original) The method of compressing data as recited in Claim 13, wherein detecting changes between the subband macro-block grouping and the reference is based on a distortion evaluation according to an equation of a more specific form:

$$e_c = W_0\|G-R\|_2^2 + W_1\|G-R\|_\infty^2 .$$

15. (Original) The method of compressing data as recited in Claim 10, wherein generating data representing differences between the first and second transform coefficient sets includes:

estimating the differences between the first collection of subbands and the subband macro-block grouping to provide motion vectors;

applying the motion vectors to the first collection of subbands to produce a prediction of the second collection of subbands; and

subtracting the prediction from the second collection of subbands resulting in a set of prediction errors.

16. (Original) The method of compressing data as recited in Claim 15, wherein estimating the differences between the first collection of subbands and the subband macro-block grouping includes:

generating a search region about a subset of transform coefficients from the first collection of subbands;

applying a related subset of transform coefficients from the subband macro-block grouping to the search region; and

traversing incrementally the related subset of transform coefficients within the search region to a position representing a best incremental match.

17. (Original) The method of compressing data as recited in Claim 16, further including traversing fractionally the related subset of transform coefficients within the search region to a position representing a best fractional match.

18. (PREVIOUSLY PRESENTED) The method of compressing data as recited in Claim 4, wherein encoding the generated data for transmission further includes identifying subsets of the generated data that are equal to zero.

19. (Original) A method of compressing data including first and second data sets comprising:

transforming the first data set and the second data set into corresponding first and second transform coefficient sets;

estimating differences between the first and second transform coefficient sets to provide motion vectors;

predicting the second transform coefficient set by applying the motion vectors to the first transform coefficient set;

subtracting the predicted second transform coefficient set from the second transform coefficient set to obtain prediction errors; and

encoding the prediction errors and the motion vectors for transfer to a decoder.

20. (Original) The method of compressing data as recited in Claim 19, wherein transforming the first data set and the second data set is carried out utilizing a tensor product wavelet transform.

21. (Original) The method of compressing data as recited in Claim 19, wherein estimating differences between the first and second transform coefficient sets includes:

generating a search region about a subset of transform coefficients from one of the first and the second transform coefficient sets;

applying a related subset of transform coefficients from the other of the first and the second transform coefficient sets to the search region; and

traversing incrementally the related subset of transform coefficients within the search region to a position representing a best incremental match.

22. (Original) The method of compressing data as recited in Claim 21, further including traversing fractionally the related subset of transform coefficients within the search region to a position representing a best fractional match.

23. (Original) The method of compressing data as recited in Claim 19, wherein transforming of the first data set and the second data set produces the first transform coefficient set as a first

collection of subbands and the second transform coefficient set as a second collection of subbands.

24. (Original) The method of compressing data as recited in Claim 23, further including macro-block packing the second collection of subbands to form a subband macro-block grouping.

25. (Original) The method of compressing data as recited in Claim 24, further including applying weighting to subband macro-blocks which make up the subband macro-block grouping.

26. (Original) The method of compressing data as recited in Claim 24, further including detecting changes between the subband macro-block grouping and a reference.

27. (Original) The method of compressing data as recited in Claim 26, wherein detecting changes between the subband macro-block grouping and a reference is based on a distortion evaluation according to a general equation of the form:

$$e_c = W_0\|G-R\|_2^2 + W_1\|G-R\|_\infty^2.$$

28. (Original) The method of compressing data as recited in Claim 19, wherein encoding the prediction errors and the motion vectors for transfer to the decoder further includes identifying subsets of the prediction errors that are equal to zero.

29. (Original) A method of compressing data including first and second data sets comprising:

transforming the first data set and the second data set into corresponding first and second transform coefficient sets;

estimating differences between the first and second data sets to provide motion vectors;

predicting the second transform coefficient set by applying the motion vectors to the first transform coefficient set; and

subtracting the predicted second transform coefficient set from the second transform coefficient set to obtain prediction errors.

30. (Original) The method of compressing data as recited in Claim 29, wherein the first transform coefficient set is error corrected.

31. (Original) A method of compressing data in an encoder to reduce the number of bits transferred to a decoder comprising:

transforming a first data set and a subsequent second data set producing corresponding first and second transform coefficient sets;

estimating differences between the first and second data sets to provide motion vectors;

predicting the second transform coefficient set by applying the motion vectors to the first data set and thereafter transforming the prediction results; and

subtracting the transformed prediction results from the second transform coefficient set to obtain prediction errors.

32. (Original) The method of compressing data as recited in Claim 31, further including inverse transforming the first transform coefficient set and providing the first transform coefficient set as a reference during predicting.

33. (Original) The method of compressing data as recited in Claim 32, wherein the first transform coefficient set is error corrected.

34. (Original) A method of packing subband blocks that correspond to a subset of a data set comprising:

disassociating a set of related subband blocks from a collection of subbands; packing the set of related subband blocks together as a subband macro-block; and

repeating the disassociating and packing steps above for each set of related subband blocks in the collection of subbands to form a subband macro-block grouping.

35. (Original) The subband macro-block packing method as recited in Claim 34, wherein the packing step includes arranging the set of related subband blocks within the subband macro-block in the same relative position the subband blocks occupied in the collection of subbands.

36. (Original) The subband macro-block packing method as recited in Claim 34, wherein the packing step includes locating the subband macro-block within the subband macro-block grouping in the same spatial location as the corresponding data subset is located within the data set.

37. (PREVIOUSLY PRESENTED) A method for transforming a data set into transform coefficients comprising transforming the data set utilizing a tensor product wavelet transform having at least two filter paths and propagating remainders derived during transforming between at least two of the filter paths,

wherein the tensor product wavelet transform is a tensor product wavelet pair for determining a high pass component and a low pass component, and

wherein transforming of each data set and propagating their remainders between the filter paths includes:

determining the low pass component and the high pass component of the data set;

normalizing the low pass component to generate a low pass normalized output and a first remainder (rl).

38. (Original) The method as recited in Claim 37, wherein the remainders from a first filter path of the at least two filter paths are propagated to a second filter path of the at least two filter paths and the remainders from the second filter path are propagated to the first filter path.

39. (Original) The method as recited in Claim 37, wherein the tensor product wavelet transform is a tensor product wavelet pair for determining a high pass component and a low pass component.

40. (PREVIOUSLY PRESENTED) The method as recited in Claim 37,

wherein transforming of each data set and propagating their remainders between the filter paths further includes:

normalizing the high pass component to generate a high pass normalized output and a second remainder (rh);

performing a first operation (g(rl,rh)) on the first and second remainders (rl, rh) and adding the results emanating therefrom to the low pass normalized output to generate an approximation; and

performing a second operation (f(rl,rh)) on the first and second remainders (rl, rh) and adding the results emanating therefrom to the high pass normalized output to generate a detail.

41. (Original) The method as recited in Claim 40, further including downsampling the low pass component and the high pass component.

42. (PREVIOUSLY PRESENTED) The method as recited in Claim 40, wherein the low pass component is determined utilizing a filter having the value -1, 2, 6, 2, -1; the high pass component is determined utilizing a filter having the value -1, 2, -1; and further including a first operation (g(rl,rh)) and a second operation (f(rl,rh)) having functions as follows:

g(rl,rh) = rh; and
f(rl,rh) = floor(rh + ½), where nh = ½.

43. (PREVIOUSLY PRESENTED) The method as recited in Claim 40, wherein the tensor product wavelet pair is of the form:

$$D_l = X_{2l} - \left\lfloor \frac{X_{2l-1} + X_{2l+1}}{2} \right\rfloor; \text{and}$$

$$A_l = X_{2l+1} + \left\lfloor \frac{D_l + D_{l+1} + 2}{4} \right\rfloor.$$

Claims 44. – 48. (CANCELED)

49. (CURRENTLY AMENDED) A method of estimating spatial changes occurring between a first data set and a second data set comprising:

generating a search region about a data subset from one of the first and second data sets;

applying a related data subset from the other of the first and second data sets to the same search region; and

traversing incrementally the related data subset within the same search region to a spatial position representing a best incremental match.

50. (ORIGINAL) The method of estimating spatial changes occurring between a first data set and a second data set as recited in Claim 49, further comprising ~~including~~ traversing

fractionally the related data subset within the search region to a position representing a best fractional match.

Claim 51 (CANCELED).

52. (CURRENTLY AMENDED) The encoder apparatus as recited in Claim ~~51~~ 53, wherein the motion compensation device carries out all operations on the first and second collection of subbands in the transform domain.

53. (PREVIOUSLY PRESENTED) An encoder apparatus comprising:

a transformation device, having an input configured to receive a first and second set of data, and further configured to generate a corresponding first and second collection of subbands;

a motion compensation device, having an input coupled to the transformation device, configured to receive the first and second collection of subbands, and further configured to efficiently represent differences between the first and second collection of subbands; and

a difference block that is configured to receive a prediction from the motion compensation device and the second collection of subbands from the transformation device, and further configured to determine the difference between the prediction and the second collection of subbands for generating a prediction error.

54. Previously Presented) The encoder apparatus as recited in Claim 53, wherein the motion compensation device includes:

a motion estimation device, coupled to the transformation device, configured to compare the first and second collection of subbands to generate motion vectors; and

a motion prediction device, coupled to the motion estimation device and the transformation device , configured to receive the motion vectors and the first collection of subbands, and further configured to generate a prediction of the second collection of subbands.

55. (Original) An encoder apparatus for detecting changes comprising:

a transformation device, having an input configured to receive a first data set and a second data set, and further configured to respectively generate therefrom a first collection of subbands and a second collection of subbands; and

a macro-block packing device having an input coupled to the transformation device and configured to receive the first collection of subbands and the second collection of subbands,

and further configured to respectively generate a first subband macro-block representation and a second subband macro-block representation.

56. (Original) The encoder apparatus as recited in Claim 55, further including a weighting device having an input configured to communicate with the macro-block packing device and configured to receive and then scale the first subband macro-block representation and the second subband macro-block representation based on perceptual importance.

57. (ORIGINAL) The encoder apparatus as recited in Claim 55, further including a change-detect device, having an input configured to communicate with the macro-block packing device and configured to compare the first subband macro-block representation and the second subband macro-block representation to determine the changes therebetween, the change-detect device further configured to generate a change-detected grouping which reflects the changes.

58. (ORIGINAL) The encoder apparatus as recited in Claim 57, further including a macro-block ranking device having an input coupled to the change-detect device and configured to rank the change-detected grouping.

59. (ORIGINAL) The encoder apparatus as recited in Claim 57, wherein the comparison of the first subband macro-block representation and the second subband macro-block representation is based on a distortion evaluation according to the general equation:

$$e_c = \sum_i W_i \|G - R\|_x^{P_x} .$$

60. (ORIGINAL) The encoder apparatus as recited in Claim 59, wherein the comparison of the first subband macro-block representation and the second subband macro-block representation is based on a distortion evaluation according to an equation of a more specific form:

$$e_c = \sum_i W_i \|G - R\|_x^{P_x} .$$